

CHAPTER 11

SUMMARY OF FINDINGS

Introduction

The Scoping Study set out to understand the potential impacts of climate change upon the South West Region of the United Kingdom, to explore the current understanding of adaptation to climate change across the region, and to consider possible responses. The principal aims of the Scoping Study were to:

- Provide an **overview of the best current information on the predicted climate scenarios at global and UK scales, and particularly at regional scale.** Specifically to report on the latest UKCIP climate scenarios for the South West region for the 2020's, the 2050's, and the 2080's. This reportage was to be based upon an understanding of historic and contemporary climate change data for the South West region.
- **Report on the levels of awareness of climate change issues across the region and within different sectors and domains.**
- Identify the main domains (and their key stakeholders) in the South West Region which will be most affected by climate, **in order to identify the main problems and opportunities associated with the impacts of climate change, and report on how stakeholders expect to adapt to potential changes in climate.**
- **Identify areas for further action and research in response to this understanding of the type and extent of potential impacts and appropriate adaptation responses.**

A brief summary of findings in response to these aims is reported in this chapter. Recommendations for further action are reported in Chapter 12 and Priorities for Future Research in Chapter 13.

Climate Data for the SW Region

The quality of climate data, both of historic climate, and modelled futures continues to improve. The UKCIP02 scenarios, upon which this study is based, are able to claim greater certainty in many aspects of the modelled climate, and are also more explicit about areas of uncertainty.

In putting together the questionnaire for this study we tried to present scenarios in a simple way that would be accessible to all. Simple scenarios were presented for single climate variables (such as average summer temperature and winter rainfall).

As well as crude numbers (e.g. °C) an attempt was made to characterise the climate scenario by reference to other places that experienced similar climate, or recent events in the UK climate that were similar. Despite this many respondents were put off by the apparent complexity of the scenarios and did not complete the questionnaire. This suggests that even this simplified data is perceived to be too complex.

Paradoxically, we also encountered the problem of some data being over simplified. So, a simple characterisation of average summer temperatures was not sufficient evidence on which to base judgements about passive heating and cooling strategies for buildings, or even the impact on coastal tourism. For even simple technical decisions on such matters to be well informed further information is needed. Data on aspects such as solar radiation, hours of sunshine, sea temperature, extreme events, cloud cover and relative humidity all also required. Whilst most of these data are available amongst the 15 climate variables reported on the UKCIP website, very few of our respondents had accessed this information. The depth of information, academic style and use of specialist terminology tends to discourage all but those well versed in the subject matter from pursuing the information they require.

The study has also revealed the fact that in speculating about future climates it is not sufficient to explore just a single variable. We have found that understanding is enhanced by describing scenarios on a seasonal basis. For example, summers can be described as drier, and warmer with similar frequencies of winds and storms, but possibly higher intensities.

Although the study was explicitly based on UKCIP02 scenarios we have found both lay and professional alternatives presented, particularly with regard to the reversal of the Gulf Stream and consequential cooling. Some detailed data are presented in graphic form in Chapter 5. The probability curves for individual climate variables have proved to be a very useful way of exploring the individual climate variables in more detail.

Awareness of Climate Change

The response of stakeholders to the subject of climate change has been mixed. Some respondents, particularly those with responsibility for the management of the natural environment, were well aware of the phenomenon. Other respondents were not only ignorant but did not seem to consider it relevant to their areas of responsibility.

It is difficult to explain this with any great confidence but two reasons suggest themselves above others:

- the apparent complexity of data;

- the fact that adaptation to climate change is not generally considered a priority.

The apparent complexity of data has already been discussed above. The study also revealed that adaptation to climate change is not generally a priority whether in the public, private or voluntary sectors. Organisations, and therefore their staff, are increasingly driven by targets, measurable outputs and missions. This means that unless adaptation to climate change is specifically on the agenda of a company, local authority or voluntary organisation, work in this area is unlikely to be regarded with any importance.

Almost all of our respondents reported that there were no policies on adapting to climate change within their organisation. It was clear that in most instances there was no-one with formal responsibility for climate change adaptation. This last fact in itself probably explains the poor response generally received to the questionnaire.

Within the different sectors that formed the focus of the study the best informed were those dealing explicitly with the natural environment. Those organisations providing water to the region, or with responsibility for nature conservation or flood defences seemed to have the fullest understanding of the potential impacts and had given some thought to adaptation responses.

Those dealing with other aspects of infrastructure and society varied in their level of awareness and understanding. It was surprising to find that those who were acknowledged experts in sustainable construction and sustainable development, with considerable expertise and experience in reducing greenhouse gases, nevertheless admitted to very little understanding of adaptation issues in their professional roles.

Business domains were again varied in their appreciation of the issues, but generally there was a low level of awareness of the issue.

Overall, there was the impression that individuals did know something about the main features of climate change scenarios for the region, but only in a personal capacity. Somehow this was not being translated into a professional application. In general, the impacts were seen as threats or challenges. It was only after extended discussion and further thought that opportunities were identified.

Impact Domains Impacts and Adaptation Responses

Natural Environment Domains

The natural environment is probably the most conspicuous and visible receptor for the impacts of weather. In both public and professional realms it is the natural environment that first comes to mind in considering the impacts of climate change, for

example through coastal and river flooding, water supply and demand, natural habitats, and potential changes in agricultural crops.

With the exception of the more linear stretches of protected coastline and some river-valley woodlands, many of the region's protected sites for nature conservation are pockets of semi-natural habitat in a sea of agricultural or occasionally urban landscape.

The South West has a Regional Biodiversity Action Plan unlike most other regions, but its practitioners in nature conservation are hampered by various perceptual, institutional and practical barriers to planning for biodiversity in the wider countryside (Watts, 2001).

With regard to **biodiversity** in the region it is clear that changes are already taking place. The range and variety of species will not just be affected by how we manage protected and designated areas but how integrated land-use and management strategies can be developed. Difficult choices are required from those with management responsibility. We have encountered many conservation specialists who have difficulty in accepting the potential impacts of climate change and seek (Canute like) to hold onto protected species and habitats in the face of significant changes in climate. Even during the course of the study we have observed a change in this attitude, and a much clearer recognition of the inevitability of climate change and the need for more radical responses.

The effects of climate change on **agriculture** are now broadly understood. These include an extended growing season, the potential for new crops, an increased requirement for water for summer irrigation, a potential loss of competitive advantage compared with other locations, and reduced die-off of pests and diseases due to warmer winters. Some of these changes are already occurring but within the farming community generally there is not much awareness or concern. At present there are more pressing issues on the agricultural agenda, including BSE, the aftermath of Foot and Mouth Disease, the implications of the Curry Report and changes to the Common Agricultural Policy.

Existing, established **woodland trees** generally are likely to survive changes in climate but new planting may require consideration of different species or different nursery regimes.

The main impacts **on the coast** will be to do with coastal erosion and the reduced depth of beaches arising from increased sea levels and storm surges. Difficult decisions are required from those with responsibility for the management of coastal defences. Abandon; manage retreat; or defend robustly are the main options in the vulnerable locations. Again an integrated approach is required.

The impact on **marine fisheries** is similar to that in agriculture. The marine harvest is already changing but there are again more pressing issues than

climate change. Traditional species such as cod are migrating north, whilst new, more exotic species are now present in southern waters. The other items on the fisherman's agenda include the recent pronouncements on EU quotas, and the need to renegotiate the Common Fisheries Policy. These have tended to pre-empt consideration of climate change impacts, despite the empirical evidence that change is already happening.

The main impacts associated with **rivers and other watercourses** concern **flooding** in its various forms. The recent experience of riverine flooding is still in the public consciousness and the planning system is now exerting further control on potential development in floodplains. Periods of intense rainfall also lead to problems associated with excessive run-off from the land, and flash flooding in both town and country, largely associated with insufficient capacity in existing drainage systems. Insurance companies are taking an increased interest in the financial consequences of flooding, and through premium pricing or new policy exclusions are likely to determine policy in this area.

Issues of both supply and demand of **water resources** are affected by increased rainfall in winter but reduced rainfall in summer. As usual storage across the seasons becomes the main problem, particularly when extended periods of summer drought will increase demand for domestic and agricultural irrigation as well as for commercial and industrial use. The quality of water is also of concern as riverflows reduce and pollutant concentrations therefore increase. Nevertheless, the water companies in the region appear to have a clear understanding of the main issues and appropriate adaptation strategies.

Society and Infrastructure Domains

The study has revealed three main issues across the domains of society and infrastructure:

- aspects relating to physical infrastructure;
- aspects relating to lifestyle;
- issues relating to the management of change.

The physical infrastructure of buildings, bridges, power transmission lines, transport infrastructure (roads, rail, air) and heritage (both natural and built) are vulnerable to most aspects of climate change. The lead-time and investment periods for infrastructure are such as to justify serious consideration of long term changes in the weather. Whilst changes in average conditions (e.g. increased rainfall in winter) will have some effect, it is changes in extreme conditions that are likely to have the greatest impact. For example, although the UKCIP02 scenarios do not suggest any significant overall changes in windiness and storms, the likelihood of extreme wind and storm events could increase, and it is these that will cause physical damage. So the main physical impacts will include flooding (riverine, coastal and urban) and possible wind damage.

Climate change will affect energy demand in the South West with reduced heating requirements in the winter probably offset by increased demand for cooling in the summer. Of particular importance to the region is the potential opportunity for further development of renewable sources of energy: biomass, vegetable oils, solar, hydroelectric, wind and wave power are all areas upon which climate change will impact. It is widely recognised that more work is required in this area, to understand better the subtle impacts of the different climate variables.

Lifestyle changes are significant in two ways. Lifestyle will influence climate change (through patterns of energy usage, transport etc.) and be influenced by it (through choices in holiday patterns and destinations, increased *al fresco* eating etc.). Such changes are elusive and there is little literature on the subject. Nevertheless we can look to examples of societies and cultures which operate in the type of climates that we anticipate, as some sort of indication of the way that society in the South West may develop.

In this report we have identified some possible lifestyle impacts such as: increased use of bicycles and walking as modes of transport; increased use of external spaces in urban areas with a consequent impact on the street scene (pavement cafes, night life etc.). Increases in outdoor physical recreation can be anticipated, with potential improvements in general health, but this may increase exposure to radiation and associated cancer risks. More research is required to track possible lifestyle changes and their wider implications.

The management of change has philosophical and political implications, as well as economic ones, in considering how best to respond to potential climate impacts. Generally decisions will be more easily made in the public sector, particularly at the large scale, if climate change attains sufficient priority. Some aspects of the private sector can be controlled by legislation, regulation, fiscal policy etc. Perhaps the most elusive challenge will be influencing individuals and householders to adapt to the changing climate in ways that do not make the situation even worse, through increased emissions.

Any adaptation responses will need to be managed in a way that does not exacerbate the global warming phenomenon. This report identifies several instances where potential adaptation strategies are in conflict with aspirations to reduce greenhouse gases and consequent global warming. This is particularly true in the transport domain, where new strategies still fail to acknowledge global warming implications. Also in the built environment there is the potential need for increased cooling in summer. Conventional responses would install fans, air-conditioning or similar cooling devices, all of which will increase energy consumption, and therefore increase global warming.

The greatest managerial challenge is to find the most appropriate policy context within which to incorporate strategies for adapting to climate change. Within large organisations the range of potential impacts is considerable so responsibility for adaptation does not just belong to a single department or unit. Issues range from building maintenance and insurance, to new market opportunities. Managers must ensure that policies and responsibilities are designed to reflect the full portfolio of concerns.

Business Domains

Future climate change scenarios suggest that significant business impacts will occur from several different climate variables. Across all business sectors generic impacts will include:

- Direct infrastructure impacts as a result of increased flooding, subsidence during dry weather, coastal erosion, possible windstorm impacts, and sea/ground-water intrusion.
- Changes in resource usage, particularly increased energy demands for cooling in summer, and reduction in winter heating demands.
- Changes to internal conditions within commercial and industrial premises, primarily hotter in the summer and winter, impacting upon production processes and workers' health.
- Health impacts as a result of higher internal and external temperatures, increased winter survival of diseases and other associated risks (eg food poisoning).
- Impacts upon supply lines and business activities as a result of flooding, subsidence, and storm impacts on transport and communications facilities.
- Climate change impacts upon markets and customers on a regional, national and international scale.
- Changes to planning and building regulations as a result of perceived climate impacts and related government legislation.
- Changes to insurance costs and coverage, in particular in vulnerable geographic areas or economic sectors, such as operations within floodplains. Financial implications related to this may include mergers and acquisitions, a lack of inward investment and an inability to develop or sell facilities.

Despite the potential risks and costs of these impacts, significant market opportunities exist for many business sectors to develop climate-proof products and services which reduce climate impacts and increase adaptability. Opportunities also exist

within specific sectors such as flood defence technologies, tourism and environmental services to capitalise on both the positive and negative impacts of climate change. The expanding market for cleaner technologies and low carbon products means that many new opportunities exist within this field and many businesses may choose to diversify into these areas. Such opportunities exist at both national and international scales.

A final consideration is the potential for litigation against companies who provide services which are subsequently impacted upon by climate change. As a result businesses may become susceptible to legal challenges if their products and services do not allow for climate changes. This is an area that needs further investigation, and may well prove to be a driving force behind many businesses accommodating climate change into future projects.

Further research to identify the probabilities of climate change impacts and to allow businesses to accommodate climate change into business planning and activities is required and should be at the forefront of research activities. Businesses themselves need to take a leading role in developing further knowledge on impacts, changing markets and adaptation responses.

Local Authority Domains

Local government within the region is currently organised through 6 County Councils, with 36 District Councils and 9 Unitary Councils. Structural changes now seem likely. These may include an enhanced role for elected regional assemblies, a growth in the number of Unitary Authorities, and a reduction in the number of County Councils.

The publication 'Community Leadership and Climate Change' identifies three principal roles for local authorities in relation to climate change. These are:

- LAs as service providers
- LAs as corporate managers
- LAs as community leaders

This wide range of activities for which local authorities are responsible means that climate change, both adaptation and mitigation, impacts on many different areas. Local Authorities need to identify those areas that are vulnerable to climate change as a matter of priority in order to develop appropriate responses. As well as considering the more obvious and statutory functions of councils, Local Authorities should also be encouraged to consider potential lifestyle changes that might be influenced by changes in the weather.

Strategic responses on climate change are being carried out by many local authorities but generally the focus is on mitigation rather than adaptation. Local Authorities are encouraged to sign up to the Nottingham Declaration on Climate Change. Again, there is only limited reference to adaptation issues within the text of the Nottingham Declaration,

despite the fact that it represents the key initiative on climate change for the public sector.

Many of the climate change adaptation issues that face local government are similar for all authorities. Certainly, neighbouring authorities are likely to experience similar changes in climate. There will be considerable benefit through co-operation between councils, both at County and District levels.

It is unlikely that adaptation to climate change will achieve sufficient priority in competing council agendas to become a major policy driver in its own right. Therefore, it will be important to find appropriate policy frameworks within which adaptation issues can be nested. One of the requirements recently imposed on local authorities is the creation of Local Strategic Partnerships (LSPs) for the purposes of developing Community Strategies (or Community Plans). It may be that this is an appropriate policy framework through which to manage climate change adaptation.

Local Authorities have an important role in emergency planning, both in preparing and co-ordinating local arrangements. Responding to extreme weather events will now become an important part of such planning.

Generally the evidence is of some general awareness of sustainability issues amongst those with environmental responsibilities (such as LA 21 officers). For others, even those with technical responsibility, the phenomenon has only just registered.

The world of local government is increasingly driven by edicts from the centre: targets, outputs and disparate but circumscribed agendas. Unless such targets include those associated with climate change, we are unlikely to see real action in the immediate future, except perhaps in those areas vulnerable to major flooding.

Cross-sectoral Domains

Because the various impact domains that have been investigated are difficult to separate from each other, it was seen as important to examine potential adaptation responses across domains.

Decisions taken in one domain (e.g. agriculture) may have major repercussions in others (e.g. biodiversity; floods). Decisions taken on upland land-use in a catchment can have major implications downstream, and this is exemplified particularly during and immediately after prolonged or high-intensity rainfall events. The role that forestry might play in intercepting precipitation and mitigating surface run-off, and the role that a more sensitive agriculture can play in providing refuges and corridors for species, are examples of cross-sectoral and multi-disciplinary issues in the South West.

Some examples from one of three localities which were studied for cross-sectoral issues illustrate how potential adaptation responses might impact across different sectors.

The complexity of change in coastal ecosystems and the economic effects that follow from this can be illustrated by changes in fish stocks off the South West coast. As a result of warmer sea temperatures, Manila clams are now well established in the waters of Poole Harbour. The clams have thrived to the point where they are now actively displacing other species, including the economically important mussel population, through competition for limited food stocks. Fishermen have had to shift their business from mussels to Manila clams.

Poole itself has benefited economically from such changes. The new types of shellfish that are being caught all round the British coasts are transported by lorry from various fishing ports to Poole. In Spain there is a ready demand, particularly to supply the Friday meal tables in this Catholic country. So the lorries with their fish consignments are then shipped from Poole to Bilbao and distributed to fish suppliers, mainly in Southern Spain. This is a new opportunity that climate change has already created.

However, there are negative consequences from these new trading patterns. The previous fishing industry based on traditional species such as cod, plaice and mussels was more environmentally friendly with regard to transport. Catches were based on boats coming into port and the fish being distributed throughout Britain by train and lorry. Now the transport is primarily based on land with fleets of lorries travelling in greater numbers and longer distances. Total CO₂ emissions are therefore much higher. Indeed such has been the impact on previous modes of fish transport, that the rail spur in Poole Harbour is threatened with closure. If the railhead closure goes ahead then it will mean that more lorries serve the needs of the port with a further increase in CO₂ emissions.

The complexity and diversity of the issues outlined above highlight the need for at least discussion, and possibly partnerships, between relevant agencies, to ensure that cross-sectoral issues such as these are recognised, understood and addressed.

All of the groups that participated in the cross-sectoral workshops were part of some multi-agency partnership, either formal or informal, which provided the context within which such issues could be addressed.

These may seem to be obvious and sensible arrangements that need no reporting, but, despite the fact that partnerships are increasingly popular in many initiatives, they have yet to be developed to include climate change adaptation. Such partnerships may well be appropriate to address the cross-sectoral complexity of adaptation to climate change.